

REMARKS

Applicants have carefully reviewed the Office Action dated April 23, 2003, and respectfully request reconsideration in view of the following remarks. A separate petition and fee to extend the time for response by three (3) months accompany this response.

Claims 1-12 are pending in this application, among which, Claims 1-10 have been rejected. The remaining claims, i.e., Claims 11 and 12 have been withdrawn from consideration as being drawn to a non-elected invention, but are subject to rejoinder, provided the other claims are eventually deemed allowable.

Election/Restriction – 35 USC § 121

Applicants affirm the election of product claims of Group I, Claims 1-10. While the claims directed to the non-elected inventions have been withdrawn from consideration, these claims, i.e., Claim 11 (drawn to a process for making the product) and Claim 12 (drawn to a process for using the product) are subject to rejoinder under MPEP 821.04 and should be rejoined, if the elected product claims are subsequently found allowable.

Claim Rejections – 35 USC § 112

Claims 2-4 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite. Reconsideration and withdrawal of this rejection are respectfully requested.

In Claim 2, the examiner has objected to the language that the alkyl aminoalkyl amine and the alkylene carbonate are reacted in "approximate" equal molar amounts as being confusing. Claim 2 has now been amended by removing the word "approximate" to avoid confusion as to what is meant by this word. This rejection should now be obviated.

Claim Rejections – 35 USC § 102

Claims 1-8 were rejected under 35 U.S.C. 102(b) as being anticipated by Honel et al. (US 5,055,542). Reconsideration and withdrawal of this rejection are respectfully requested.

At the outset, Claim 1 has been amended to more clearly distinguish the invention from the cited art. Claim 1 was amended to clearly point out that the constituents used in forming the pigment dispersant do not contain long-chain urethane arms attached to the backbone (i.e., Honel's component (c)) which would

increase molecular weight and build viscosity in the pigment dispersant and as a result raise the VOC of the electrocuting bath. Honel et al are clearly aimed at making large molecules, to improve the lipophilic character of the dispersant and the degree of flexibility of the end groups. The term "consisting essentially of" has been used in claim 1 to clearly point out that such constituents are not included in the dispersant of the claimed invention.

The present invention, on the other hand, is directed to a specific type of low molecular weight, water-dispersible, pigment dispersant resin containing epoxy groups and water-dispersible quaternary amine groups, which do not include the forgoing arms, and which have excellent ability to wet out lead-free pigments now used in electrocoating baths and also are of relatively low viscosity. The low viscosity of the dispersant, in particular, allows the dispersant to be made at high solids thus resulting in the aqueous electrocoating bath formulated with such pigment dispersants to have a low VOC (less than 0.25 pounds per gallon) which meets current air pollution regulations.

The main advantage of the instant invention is the formation of a tertiary amine salt from an alkyl aminoalkyl amine (e.g., dimethylaminopropylamine) and an alkylene carbonate (e.g., propylene carbonate). The resulting amine salt is a low viscosity, low solvent, liquid material which when used to quaternize the epoxy resin produces a pigment dispersant that can disperse pigment in a cathodic electrocoating composition with little additional solvent. This results in the formation of a low VOC electrocoating bath.

Honel et al. teach a pigment dispersant based on ring opening of a carbonate with an amine. However, the reaction proceeds in the reverse fashion to the present invention. In contrast to the claimed invention in which the ring opening reaction occurs in the first step prior to attachment to epoxy, in Honel et al. the carbonate is attached to the epoxy backbone first and ring opening is accomplished on this preformed backbone. As a consequence Honel et al cannot achieve the same structure as formed in the present invention. In Honel et al. the urethane radical (d) that is formed in the ring opening reaction is buried in the backbone so that little pigment interacting ability is imparted here. As pointed out previously, Honel et al further favors capping hydroxyl groups with long chain isocyanates (Honel's component (c)) which provide the undesirable arms, which do not have the beta hydroxyl group structure known to give excellent pigment interaction. In the present invention, a terminal beta-hydroxyl alkyl urethane group and a terminal beta-hydroxy quaternary ammonium group are formed, resulting not only in low molecular weight low viscosity resin, but also in a very favorable configuration for a pigment dispersant resulting in both ionic and non-ionic interaction.

Accordingly Honel et al fail to anticipate the invention as now claimed. Reconsideration and withdrawal of the Section 102 rejection over this reference are therefore respectfully requested.

Claims 1-10 were also rejected under 35 U.S.C. 102(e) as being anticipated by Klein et al. (US 6,268,409).

First, it should be noted that Klein et al are not directed to pigment dispersants. On the contrary, the resins formed in Klein are used as binder resins for electrocoating baths and therefore have a much larger size and a very different structure.

Also, the first reaction in Klein et al is that of an amine with an epoxy. After the initial reaction of the primary amine with the epoxy, the product can further react with additional epoxy to form the adduct. This is noted in Klein et al. column 2, lines 42-48. The sequence of reactions in Klein et al leads to chain extension and polymerization. In the instant invention, a small reactive molecule is produced by the reaction of diamine with cyclocarbonate. This intermediate so-produced is then used to cap a polyepoxide so that further reaction cannot take place. This produces a compact molecule with flexible end groups and quaternary sites that are readily accessible and ideally suited for binding with pigment making this material an excellent pigment dispersant. By contrast the material resulting from the reaction taught in Klein et al. results in a molecule with many bulky epoxy residues that shield the quaternary groups so one would not expect this type of structure would make an effective pigment dispersant. Furthermore while Klein et al, like Honel et al., also teach use of cyclic carbonate groups, these groups are attached to the epoxy resin backbone first and ring opening with an amine would be accomplished on this preformed backbone. As a consequence Klein et al cannot achieve the same structure as in the present invention.

For the forgoing reasons, Klein et al fail to anticipate the claimed invention. Reconsideration and withdrawal of the Section 102 rejection over this reference are therefore respectfully requested.

Supplemental IDS

Applicant has submitted an additional reference in a supplemental information disclosure statement, namely Bosso et al. (US 4,001,156) which describes a conventional pigment dispersant resin containing epoxy groups and quaternary ammonium groups that has been used in the past.

C nclusion

The claims have been amended to more clearly point out the invention and the patentable differences between Applicants' invention and the cited art have been set forth. The application should now be in allowable form. If for some reason the application is not allowable, Applicants' attorney request a telephonic interview with the Examiner to discuss the case and any additional amendments to the claims that may be required to place the case in allowable form.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'St-CB', with a long horizontal flourish extending to the right.

STEVEN C. BENJAMIN
ATTORNEY FOR APPLICANTS
REGISTRATION NO. 36,087
TELEPHONE: (302) 992-2236
FACSIMILE: (302) 992-2533

Dated: 10-22-03